

Case 1 $r_1 \neq r_2$
 $y_1 = e^{r_1 x}, y_2 = e^{r_2 x}$
 $y = c_1 y_1 + c_2 y_2$

Case 2 $r_1 = r_2$
 $y_1 = e^{r_1 x}, y_2 = x e^{r_1 x}$
 $y = c_1 y_1 + c_2 y_2$

Case 3 $r_1 = \lambda + \omega i$
 $r_2 = \lambda - \omega i$

Bernoulli

$$y' + p(x)y = f(x)y^r$$

$$y' + p(x)y = 0 \quad \Rightarrow \quad \frac{u'}{u^r} = f(x)y^{r-1}$$

$$y = u v$$